ANNUAL REPORT 2009-2010

Stormwater Monitoring Coalition
Of Southern California

October 22, 2010

INTRODUCTION

As a result of the increasing regulatory focus and the lack of scientific knowledge base, both stormwater regulators and municipal stormwater management agencies throughout southern California have developed a collaborative working relationship. The goal of this relationship is to develop the technical information necessary to better understand stormwater mechanisms and impacts, and then develop the tools that will effectively and efficiently improve stormwater decision-making. As individuals and agency representatives, there was early recognition that these issues are oftentimes not localized, but typically cross watershed and jurisdictional boundaries. This relationship culminated in a formal letter of agreement, signed in 2000 and again in 2009, by all of the Phase I municipal stormwater NPDES lead permittees and the NPDES regulatory agencies in southern California to create the Stormwater Monitoring Coalition (SMC) (Table 1).

Table 1. List of member agencies in the Stormwater Monitoring Coalition.

California Regional Water Quality Control Board, Los Angeles Region
California Regional Water Quality Control Board, San Diego Region
California Regional Water Quality Control Board, Santa Ana Region
California Department of Transportation, Caltrans
City of Long Beach
City of Los Angeles, Watershed Protection Division
County of Orange, Public Facilities and Resources Dept.
County of San Diego Stormwater Management Program
Los Angeles County Department of Public Works
Riverside County Flood Control and Water Conservation District
San Bernardino County Flood Control District
Southern California Coastal Water Research Project
State Water Resources Control Board
US Environmental Protection Agency, Office of Research and Development
Ventura County Watershed Protection District

The first project supported by the SMC was to develop a five-year Research Agenda. The research agenda, published in 2001, consisted of 15 unique projects that the SMC ranked, prioritized, and then funded on a voluntary basis. The SMC has made tremendous progress implementing the Research Agenda. To date, over a dozen projects have been implemented by the SMC.

The value of the SMC to its member agencies is at least four-fold. The first is the ability to share costs for implementing projects. Cost reductions for SMC member agencies can be significant since collaborative projects can reduce costs by more than 90% relative to footing the bill alone. In addition, the majority of projects have nonmember agency cost-matching. Just for the projects described in this report, there has been nearly one million dollars in grant awards, cost-match, or in-kind services. The second value to member agencies is the ability to stretch their agency's skill base. Stormwater management requires a wide variety of knowledge including regulatory policy, engineering, hydrology, biology, chemistry, toxicity, and microbiology, to name a few. Many member

agencies have limited staff and, by working together, garner the additional skills that are not sustainable within each agency. A third asset of membership is the ability to communicate. Discussions among member agencies provide context and a richness of ideas for application to local issues back home. Similarly, discussion between regulatory and regulated agencies in an informal setting leads to more effective implementation of management activities. Finally, projects conducted under the SMC umbrella have nearly always resulted in some management action. Often, it is difficult for a single agency to affect the current course of regulatory management. Because SMC projects are initiated and vetted through all of the regulated and regulatory management agencies, the results are adopted quickly into the management framework including alterations to NPDES permits.

The SMC has shown tremendous growth over the last 10 years. The SMC has faced and overcame several potential stumbling blocks such as project funding mechanisms, turnover of member agency staff, identifying and implementing outreach and communication activities, and invigorating new project leadership. The SMC now faces a new set of challenges for the year to come. Most significant of these is the ability to identify and implement a new research agenda. The technical complexities facing stormwater managers and the ever-expanding regulatory framework in which they interact seems enormous. The new research agenda should help identify, clarify, and prioritize the direction of the SMC for the next phase of its existence. A second test of the SMC's growing pains is its ability to adapt and evolve. For example, initiating and authorizing new project agreements now takes over two years. This is insufficient for an organization that wants to be adaptive and respond to opportunities. The SMC appears poised to tackle these challenges and continue its growth, remaining a vibrant and meaningful collaboration.

PROJECT ACCOMPLISHMENTS

Stormwater Data Compilation Study

Status: 90% complete
Project Budget: $75,000 (Resources provided by SCCWRP)

Assessment and prioritization for mitigating water quality requires context. Knowledge of mean concentrations across watersheds, counties, and regulatory jurisdictions provides the perspective needed for managers to rank waterbodies for management action. Regional reference condition, frequency of water quality objective exceedences, extent and distribution of parameter concentrations all play a part in determining where a manager's worst problem occur.

To help managers gain the necessary perspective, the SMC described a project in their Research Agenda that compiles water quality monitoring information regionwide. For several years, the SMC has been building the necessary infrastructure to support such an effort. Data sharing protocols, interlaboratory calibrations, and web-enabled interfaces all enhance the SMC's ability to share data. The goal of this project is to compile the

existing water quality monitoring information. Initially starting with nutrients, the objective will be to make annual estimates of concentrations and mass emissions from 25 watersheds between Ventura and San Diego.

To date, more than 600,000 data records have been compiled among all SMC agencies. Initial assessments indicated that there was tremendous variation and completeness among the data submittals. However, the greatest hindrance towards achieving our goal was not the lack of concentration data, but the lack of flow data. Ultimately, this impacted the ability to estimate annual loads. The data set is currently being augmented with the missing data prior to final load estimates. SCCWRP staff is working with SMC agencies to update data submittal procedures for the coming storm season and address remaining issues to improve load estimation.

Implementing A Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program
Status: 65% complete
Project budget: $150,000 ($75,000 contract from the SWRCB)

Assessment of freshwater biological communities represents a potentially powerful tool for evaluating the effects of discharges in southern California creeks and streams. Bioassessments integrate the effects of multiple stressors, including chemical pollutants and physical alterations in receiving waters. The value of biological assessments is that they are closer to many of the defined beneficial uses of receiving waters (i.e. aquatic life, warm water habitat, cold water habitat) than chemically-derived water quality objectives. As a result, virtually every SMC member agency has biological community monitoring in their respective NPDES permits.

The goal of this study is to implement a coordinated, integrated regional bioassessment monitoring program. Previously, the SMC had worked together to design an optimal monitoring program that satisfied both local needs, but simultaneously provided information that could be combined to make regionwide assessments. Monitoring questions included: 1) What is the extent of impact in streams of southern California? 2) What are the stressors that impact southern California streams? and 3) Is the extent of stream impacts changing over time?

This is the second year of a five-year project. In the first year, over 110 sites were sampled between Ventura and San Diego counties for biological communities, water quality, physical habitat, and riparian condition. Preliminary results indicated that roughly 50% of the stream miles in southern California have healthy biological communities. In addition, the extent of chemical contamination appears lower than previously thought. For example, less than 3% of the stream miles exceeded the chronic water quality criterion for copper. Sampling for the second year is now finished and samples are at the laboratory for analysis.

The SMC regional watershed monitoring program is now serving as a model for other parts of the state. Regional watershed programs in the San Francisco Bay and the Central

Valley are planning to use the SMC as a model for their design and implementation. Perhaps the biggest value of the SMC regional watershed monitoring, however, is its connection to the SWRCB's development of biological objectives. This new policy will set narrative and numeric limits on biological condition in streams statewide. Because of the unique collaboration in southern California, approximately one-third of the data used to develop the biological objectives will come from the SMC region.

Our main collaborator on this project is the California Department of Fish and Game (CDF&G) and SWRCB. The project is 50% funded by the SWRCB, whose main desire is to ensure integration with the Surface Water Ambient Monitoring Program (SWAMP).

Laboratory Intercalibration Study
Status: 100% complete
Project budget: $17,000 (in-kind services from all participating laboratories)

One goal of the southern California Stormwater Monitoring Coalition (SMC) is to compile monitoring data from separate monitoring programs to make regionwide assessments. For example, the SMC is participating in Regional Monitoring and Regional Data Compilation studies (see previous studies). Both of these studies require not only high quality data, but comparability among laboratories. Despite all SMC laboratories being State-certified, previous intercalibration studies have demonstrated interlaboratory coefficients of variation in excess of 100% for many constituents. As a result, the SMC has endorsed laboratory intercalibration studies based on the types of samples for which they are responsible.

Two laboratory intercalibrations have been conducted previously by the SMC. Both intercalibrations utilized approximately a dozen laboratories and focused on suspended solids (TSS), nutrients, and trace metals. Samples were distributed to each laboratory blind and in triplicate, thus assessing both within and between lab variation. Multiple iterations were required for some constituents in the first iteration, but the variability between laboratories was reduced to within laboratory variance ($\leq$ 20%) for most constituents. The end result was a performance-based Guidance Manual that defines the sensitivity, accuracy, and precision necessary for analyzing samples for any SMC member agency <ftp://ftp.sccwrp.org/pub/download/PDFs/420_smc_chem.pdf>. Ultimately, a scoring system that defined letter grades for intercalibration performance was developed and the SMC began using these grades as a screening tool for selecting contractors.

The goal of this project, the third laboratory intercalibration, was to fill in the missing information to make the Laboratory Guidance Manual an ongoing and effective document. It involved four steps: 1) recruiting laboratories; 2) repeating the laboratory intercalibration for TSS, nutrients, and trace metals; 3) initiate an intercalibration for organic constituents; and 4) revise and update the Laboratory Guidance Manual. A technical Working Group consisting mostly of laboratory managers was formed to assist in the study.

The SMC has successfully finished the intercalibration this year. The number of participating laboratories increased to fifteen. Certified reference materials, a dry weather runoff sample, and a wet weather runoff sample from an urban land use were all delivered blind and in triplicate to participating laboratories. A longer list of nutrients and metals were added to mimic the list being analyzed for the regional watershed monitoring program. In addition, a number of the constituent reporting limits were lowered to ensure consistency with the SWRCB's ambient monitoring program. The intercalibration for organics focused on over 50 chlorinated hydrocarbons (CHCs; i.e., DDTs, chlordanes, and PCBs) and eight pyrethroid pesticides (i.e., bifenthrin). CHCs were one focus because of the difficulty in confident low level analysis and implication in TMDLs for each of the RWQCB jurisdictions. Pyrethroid pesticides were selected because of its increasingly wide use in the urban landscape by homeowners. To ensure measureable levels of organic analytes, samples were created by distributing unknown calibration standards or by mixing contaminated sediments into a dry weather runoff sample.

Once again, the laboratories performed well after the first iteration for TSS, nutrients, and trace metals. Nearly all laboratories, including the new laboratories, achieved a grade of A or B. Laboratories required multiple iterations to achieve a level of moderate success for the organic analytes. Only a subset of laboratories had the capacity to analyze these difficult compounds, and not all that did participate could achieve the desired reporting levels. Interlaboratory variability achieved a level of acceptable level of comparability, but this was for a calibration sample of known concentration in the simplest of all matrices. Future intercalibrations should challenge the laboratories with in-matrix samples.

The SMC is pursuing a future interlaboratory calibration agreement to maintain the periodicity of the intercalibration, add further organic constituents (i.e., PAHs), and increase the quality and comparability of toxicity measurements.

Hydromodification Study
Status: 50% complete
Project budget: $1,137,440 (State Prop 50 Grant)

The process of urbanization has the potential to affect stream courses by altering watershed hydrology. Development and redevelopment can increase the amount of impervious surfaces on formerly undeveloped landscapes. This reduces the capacity of remaining pervious surfaces to capture and infiltrate rainfall and, as a result, a larger percentage of rainfall becomes runoff during any given storm. In addition, runoff reaches the stream channel much more efficiently, so peak discharge rates post-development are higher compared to predevelopment for an equivalent rainfall event. This process has been termed hydromodification.

Hydromodification can result in adverse effects to stream habitat, surface water quality, and water supply. The stream erosion that results from the increased peak flow can

threaten infrastructure, homes, and businesses. Intermittent and ephemeral streams that possess riparian and wetland habitat are at particular risk from effects of hydromodification. Streams in semi-arid regions are especially vulnerable to urbanization due to a prevalence of sand bed channels, lack of vegetative reinforcement, and relatively large net changes in water and sediment supply associated with stormwater runoff. Recent studies by the SMC have indicated that intermittent and ephemeral streams in southern California degrade at lower levels of watershed urbanization than streams in the eastern US.

In response to the effects of hydromodification, state and local agencies are developing standards and management approaches to control and/or mitigate the effects of hydromodification on natural and semi-natural stream courses. Successful implementation of these regulatory programs requires development of tools to better assess hydromodification effects and develop appropriate mitigation and management strategies.

The goal of this project is to develop a series of tools supporting implementation of hydromodification management measures that could be used to better protect the physical, chemical, and biological integrity of streams and their associated beneficial uses. This project will provide tools to answer the following questions: 1) Which streams are at the greatest risk from the effects of hydromodification? 2) What are the anticipated effects in terms of increased erosion, sedimentation, or habitat loss, associated with increases in impervious cover? 3) What are some potential management measures that could be implemented to offset hydromodification effects and how effective are they likely to be?

This project is being conducted in collaboration with researchers from Colorado State University, Fort Collins. Several milestones have been reached over the previous year. First we completed a review of mapping and classification literature that will serve as the foundation for the classification system developed by this project ftp://ftp.sccwrp.org/pub/download/PDFs/562_Hydromod_LitReview.pdf. Second, we completed an extensive field campaign that has resulted in a database containing detailed information on channel condition, hydraulics, sedimentary characteristics and other attributes of over 30 stream segments across a gradient of urbanization and landscape settings. Drainage basins have been delineated for all sites and we have quantified several essential watershed metrics for each stream (e.g. watershed area, % impervious, annual rainfall, % burned within last few years, and NRCS soil types vs. rock). Several tools were developed to support processing of the field data, including automated spreadsheets for combining sieve and pebble count sediment samples, as well as for performing numerous hydraulic analyses and generating stream stability metrics. We have also made progress in developing tools for classification and extrapolation flow duration curves from gaged to ungaged sites in regional hydrologic analyses and have populated a database with pre-development flood estimates for each field site.

Low Impact Development Study
Status: 80% complete
Project budget: $1,100,000 ($500,000 SMC plus $600,000 State Prop 40 Grant)

The Low Impact Development Guidance (LID) Study is being conducted with funding from the State Water Resource Control Board's Consolidated Grants Program, under the Urban Runoff Program of Proposition 40. The LID Project will develop a comprehensive program to incorporate LID strategies and techniques into the planning and design of public and private sector projects. The LID Project will develop a model program for localities in California that are interested in adopting LID strategies and techniques.

This project has been successful in attaining these goals:

- **Develop interim guidance and training for LID implementation.** Four training sessions were held throughout the Southern California region from 2007 through 2008.

- **Determine effectiveness of LID for reduction of pollutant loads and hydrologic changes in Southern California.** Monitoring results were used to assess the volume and concentration benefits to discharges, the percentage of runoff from various BMPs and LID systems measured, and a review of the soil type. There are ongoing LID monitoring programs that will provide additional results regarding the effectiveness of LIDs in Southern California.

- **Develop guidelines on specifications and standards for Project design and review.** The SMC and CASQA finalized the LID Guidance Manual in April 2010. It is now located on the CASQA web site.

- **Develop final guidance and training materials using field data.** This goal was partially met. The San Bernardino Flood Control District and the SMC have developed final guidance and training materials using the feedback from interim trainings, the literature review, and using the final LID Guidance Manual. However, field data collected as part of this project has yet to be incorporated into the LID Guidance Manual.

- **Conduct training workshops in Southern California. In addition to the i**nterim training workshops, final Training was provided by online web access to the Manual and presentations that provided manual content and access information.

The District coordinated with various regional and statewide efforts that involved LID training, including San Diego County, the California Water and Land Use Partnership, the California Coastal Commission, the Local Government Commission, and the Chino Basin Landscape Alliance. The collaborative regional effort was a critical networking tool that provided additional funding, technical support, and LID monitoring opportunities. Partner agencies included the County of San Diego, Riverside County, and CASQA, all of whom helped support the project when Grant funding was frozen mid-project by the State of California. Approximately $260,000 has been leveraged for future activities during the 2010-2011 and 2011-2012 fiscal years.

SMC and CASQA plan to continue updating the LID Guidance Manual and provide training sessions. Monitoring is planned to continue through spring of 2012. Monitoring reports are expected to be provided upon completion of data analysis and reporting. The Local Government Commission, in conjunction with the SMC, has planned a program to identify barriers to LID implementation. This project will conduct a literature review focusing on the site design and approval processes and associated codes, processes and perceptions, generating and distributing a survey to identify the barriers. The program will then develop strategies to overcome barriers to LID implementation.

Effects of Wildfires on Contaminant Runoff and Emissions
Status: 75% complete
Project Budget: $100,000 + in-kind contributions ($75,000 provided by San Diego County, $25,000 provided by the Los Angeles Regional Water Quality Control Board, in-kind services provided by UCLA and Los Angeles County Flood Control District)

Fire is a natural component of Mediterranean ecosystems, such as those found in southern California. Due to loss of plant cover, severe burns have been shown to increase runoff and sediment generation to downstream areas. Constituents associated with the increased runoff have the potential to affect water quality in downstream receiving waters and the near-shore coastal environment. This may be especially problematic for streams that are already impaired. Most research on post-fire water quality has focused on nutrient and sediment enrichment in relatively natural areas. However, post-fire runoff also has the potential to increase loadings of carbon, organic compounds such as PAHs, and trace metals. Constituent loadings may occur by several mechanisms over a range of spatial and temporal scales. Potential loading mechanisms include direct runoff, debris flows, or atmospheric deposition of ash followed by storm runoff. Investigating the magnitude and duration of fire effects in downstream and/or adjacent watersheds is critical to accounting for its influence on cumulative water quality impacts and attaining water quality standards.

This goal of this project is to investigate the fate of water quality constituents resulting from southern California wildfires in order to quantify the effects of post-fire runoff on downstream metals and organic constituent concentrations and loads. Contaminant loading and effects on instream biota will be investigated as part of this project.

A regional post-fire monitoring strategy was completed in 2009 (SCCWRP Technical Report # 598) that describes an agreed-upon approach for post-fire sampling. This plan was implemented for the first time following the 2010 Station Fire, which burned portions of the Los Angeles and San Gabriel River watersheds. Two sites were sampled for solids, metals, and PAHs over six storms following the 2010 fires; Tujunga Wash and Arroyo Seco. Results showed dramatic increases in concentrations and loads of all constituents sampled following storms, but returning to near pre-fire levels by the end of the storm season. The results of this analysis are currently being written up as for submittal a journal and inclusion in next year's SCCWRP Annual Report. In addition, six sites in the affected burn area that were sampled in 2009 as part of the SMC Regional Bioassessment Program were resampled in sping 2010 for basic water chemistry, CRAM, and benthic macroinvertebrates. Analysis of the date from these sites in pending and will be completed over the next year.